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EXAMINER
AZEMAR, GUERSSY

ART UNIT	PAPER NUMBER
2613	

DATE MAILED: 10/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/649,007	COPPINGER ET AL.	
	Examiner	Art Unit	
	Guerssy Azemar	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 August 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/20/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract of the application exceeds the 150-word requirement.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 27 recites the limitation "the RF phase shift device" in the second line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-3, 6, 7, 9-14, 17-28 are rejected under 35 U.S.C. 102(b) as being anticipated by Piehler et al. (5,940,196).

(1) With respect to claims 1 and 12:

As shown in figure 5, Piehler et al. teaches a method and apparatus of transmitting in an optical communication channel, comprising the acts of:

providing a first optical signal having a first center wavelength (λ_1 in figure 5);

providing a second optical signal having a second center wavelength (λ_2 in figure 5);

modulating the first and second optical signals by an information signal (86 in figure 5, modulated by the RF signal going into block 86); and

propagating the first and second modulated optical signals in the optical communications channel (the signal is then transmitted over the fiber span 90);

wherein the phase of the information carried by the first optical signal is shifted relative to the phase of the information carried by the second optical signal (column 4, lines 32, 33, adjusting the phases relative to one another is a matter of shifting them or one of them so that they are at 180 degrees phase difference).

(2) With respect to claims 2 and 13:

Piehler et al. teaches the method and apparatus, wherein the channel is a span of fiber (90 in figure 5).

(3) With respect to claims 3 and 14:

Piehler et al. teaches the method and apparatus, wherein the phase is shifted at a transmitter or a repeater coupled to the channel (58 in figure 3, this extra fiber is located at the transmitter area to provide delay, blocks 34, 36, 48 are responsible for the transmission of the signal, hence they are the transmitter. Another embodiment of the

invention shown in figure 7A, discloses a delay device 146 and 148 at a transmitter area, see also column 8, lines 24, 25).

(4) With respect to claim 6:

Piehler et al. teaches the method, wherein the shift is a predetermined delay sufficient to compensate for dispersion in the optical communications channel (column 3, lines 1 – 8, the reference states that a delay correct for a phenomenon known as dispersion).

(5) With respect to claims 7 and 28:

Piehler et al. teaches the method, wherein the shift is a predetermined delay Sufficient (110 in figure 5, that block constitutes the delay element, see line 56 in column 6) to minimize CNR degradation in the channel (column 2, lines 31 – 33, by combining block 110 recombines the two signals and in doing so, the CNR is increased).

(6) With respect to claims 9 and 22:

Piehler et al. teaches the method, wherein the shift is provided by an optical modulator (86 in figure 6A) in combination with a plurality of wavelength division multiplexers (96 and 96a in figure 6A) outputting the first and second optical signals ($\lambda 1$ and $\lambda 2$ of both 96 and 96a in figure 6A).

(7) With respect to claims 10 and 23:

Piehler et al. teaches the method further comprising the act of determining an amount of the shift as a function of the length of the optical communications channel (column 5, line 18, the length of the fiber is represented by the letter L in the function)

and the wavelengths of the optical signals (column 5, line 17, the difference between the wavelengths λ_1 and λ_2, represented by $\Delta\lambda$).

(8) With respect to claims 11 and 24:

Piehler et al. teaches the method, wherein the first optical signal has a shorter wavelength than the second optical signal (in column 5, line 9, the reference states that the difference between λ_1 and λ_2 which is represented in the function by $\Delta\lambda$ is equal to 3 nm, therefore it is mathematically true that λ_1 is shorter than λ_2 since $\Delta\lambda = \lambda_2 - \lambda_1 =$ positive 3).

(9) With respect to claim 17:

Piehler et al. teaches the apparatus, wherein the delay device includes one of an optical delay element or a radio frequency delay element (column 3, lines 7 – 9, the delay may be RF or optical, or even a combination of the two as supported by the reference in column 5, line 34 - 36).

(10) With respect to claim 18:

Piehler et al. teaches the apparatus, wherein the optical delay element is selected from a group consisting of a length of optical transmission media, a chirp grating, a length of dispersion compensation optical fiber, and a length of optical fiber with either high positive or high negative dispersion (58 in figure 3, the delay element here is a length of a transmission medium).

(11) With respect to claim 19:

Piehler et al. teaches the apparatus, wherein the delay device (250 and 252 in figure 8B) comprises a first wavelength division multiplexer (244 in figure 8B) coupled to

a first end of a length of optical transmission media (the link between 244 and 250 in figure 8B), and a second wavelength division multiplexer (274 in figure 8B) coupled to a second end of the length of optical transmission media (the link between 250 and 274 in figure 8B).

(12) With respect to claims 20 and 26:

Piehler et al. teaches the apparatus, wherein the optical delay element (146 in figure 7A) is coupled between the source of the first optical signal (142 in figure 7A) and the channel (170 in figure 7A).

(13) With respect to claim 21:

Piehler et al. teaches the apparatus, wherein the radio frequency delay element (146 in figure 7A) is coupled between the source of the information signal (142 in figure 7A) and the source of the first optical signal (152 in figure 7A, the source of the optical signal originates from the transmitter 152 in figure 7A).

(14) With respect to claim 25:

Piehler et al. teaches the apparatus further comprising

a first wavelength division multiplexer (236 in figure 8B) coupled to the sources of the first (230 in figure 8B) and second optical signals (232 in figure 8B); and

a modulator (238 in figure 8B) coupled to receive the information signal and thereby to modulate signals from the first wavelength division multiplexer (238 in figure 8B is directly coupled to multiplexer 236);

wherein the delay device (delay device includes 244, 250, 252, and 274 in figure 8B) includes:

a second wavelength multiplexer (244 in figure 8B) coupled to an output port of the modulator (coupled through path 242 in figure 8B); and

a third wavelength division multiplexer (274 in figure 8B) coupled to receive signals output from the second wavelength division multiplexer (from WDM 244 in figure 8B).

(15) With respect to claim 27:

Piehler et al. teaches the apparatus, further comprising a modulator (238 in figure 8B) coupled to receive the information signal (receive information signal from first and second sources 230 and 232 in figure 8B through multiplexer 236), thereby to modulate the optical signals, and wherein the RF phase shift device (238 in figure 8B, which is also known as the phase modulator) comprises a plurality of wavelength division multiplexers coupled to an output port of the modulator (244 and 274 in figure 8B).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Piehler et al. (5,940,196).

As shown in figure 5, Piehler et al. teaches a method and apparatus of transmitting in an optical communication channel, comprising the acts of:

providing a first optical signal having a first center wavelength (λ_1 in figure 5);

providing a second optical signal having a second center wavelength (λ_2 in figure 5);

modulating the first and second optical signals by an information signal (86 in figure 5, modulated by the RF signal going into block 86); and

propagating the first and second modulated optical signals in the optical communications channel (the signal is then transmitted over the fiber span 90);

Piehler et al. does not explicitly teach the phase of the information carried by the first optical signal is shifted relative to the phase of the information carried by the second optical signal.

However, Piehler et al. teaches shifting λ_1 and λ_2 (column 4, line 41).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention, as a matter of design choice, to shift the both parameters since it would achieve the functional equivalence, which is having both signal at a 180 degree phase difference during transmission (column 7, lines 10, 11).

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Piehler et al. (5,940,196) in view of Sauer et al. (6,559,986).

Piehler et al. teaches all of the subject matter as described above except for the method further comprising the acts of:

providing a third optical signal having a third center wavelength;

modulating the third optical signal by the information signal; and

propagating the third modulated optical signal in the optical communications channel;

wherein the phase of the information carried by the third optical signal is shifted relative to the phase of the information carried by the first and second optical signals.

However, Sauer et al. teaches the method further comprising the acts of:

providing a third optical signal (Pn in the figure) having a third center wavelength (λ_n in the figure);

modulating the third optical signal by the information signal (4 in the figure); and

propagating the third modulated optical signal in the optical communications channel (3 in the figure);

wherein the phase of the information carried by the third optical signal is shifted relative to the phase of the information carried by the first and second optical signals (As shown in the graphs above and below the drawing, modulating the signals is shifting them relative to one another).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the third optical signal as taught by Sauer et al. in the transmitter taught by Piehler et al. since because, in doing so, no distortions of the signal would occur (column 2, line 20).

8. Claims 4 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Piehler et al. (5,940,196) in view of Schemmann et al. (20030005467).

Piehler et al. teaches all of the subject matter as described above except for the method, wherein the shift is a predetermined delay sufficient to suppress composite second order distortion in the channel.

However, Schemmann et al. teaches the method, wherein the shift is a predetermined delay sufficient to suppress composite second order distortion in the channel (50 in figure 4, page 3, paragraph 0040, in which second order distortions and third order distortions are phase shifted so that they cancel each other out, therefore suppressing CSO in the process).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use the delay technique taught by Schemmann et al. in the communication system taught by Piehler et al. because it would have been cheaper (page 1, paragraph 0019).

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Piehler et al. (5,940,196) and Schemmann et al. (20030005467) as applied to claim 1 above, and further in view of Olshansky et al. (4,953,156).

Piehler et al. and Schemmann et al. teach all of the subject matter as described above except for the method, wherein the shift is in the range of about 0.25 to 4 ns.

However, Olshansky et al. teaches the method, wherein the shift is 2.5 ns (column 8, line 61, the reference teaches a delay of 2.5 ns).

Olshansky et al. does not explicitly teach a range of values, but does however teach a delay that falls well within the specified range of the applicant. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to

have calibrated the delay device as taught by Olshansky et al. in the communications device taught by Piehler et al. because a favorable BER or SNR is maintained (column 3, line 54).

10. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Piehler et al. (5,940,196) in view of Olshansky et al. (4,953,156).

Piehler et al. teaches all of the subject matter as described above except for the method, wherein the shift is in the range of about 0.25 to 4 ns.

However, Olshansky et al. teaches the method, wherein the shift is 2.5 ns (column 8, line 61, the reference teaches a delay of 2.5 ns).

Olshansky et al. does not explicitly teach a range of values, but does however teach a delay that falls well within the specified range of the applicant. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to have calibrated the delay device as taught by Olshansky et al. in the communications device taught by Piehler et al. because a favorable BER or SNR is maintained (column 3, line 54).

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Guerssy Azemar whose telephone number is (571)270-1076. The examiner can normally be reached on Mon-Fri (every other Fridays off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on (571)272-3078. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Guerssy Azemar

10/10/2006

KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER